



Letter to the Editor

Monkeys, girls, boys and toys: A confirmation Letter regarding “Sex differences in toy preferences: Striking parallels between monkeys and humans”

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We are thrilled to have independent confirmation of our finding (Alexander and Hines, 2002) that non-human primates show preferences for sex-typed toys similar to those seen in human children. As we said in our 2002 report, “monkeys show sex differences in toy preferences similar to those documented previously in children.... providing additional support for the hypothesis that sex differences in toy preferences can arise independent of the social and cognitive mechanisms thought by many to be the primary influences on toy preferences.”

When we first reported sex-typed toy preferences in vervet monkeys, the results were extremely surprising and were met with some scepticism. Now, publication of a second study showing that male monkeys show more interest in boys' toys than do female monkeys (Hassett et al., *in press*) strengthens the evidence of inborn influences on sex-typed toy preferences, and augments prior findings that girls exposed to high levels of androgen prenatally show increased interest in boys' toys, and reduced interest in girls' toys (Berenbaum and Hines, 1992; Pasterski et al., 2005). Unlike Alexander and Hines (2002), Hassett et al. did not find that females preferred toys described as feminine over those described as masculine, nor did they find that females preferred these toys more than males did. We think that they did not see these effects because they used plush toys as feminine toys, and plush toys do not have substantially greater incentive value for girls than for boys (Maccoby and Jacklin, 1974; Alexander and Hines, 2002).

There is considerable evidence that sex differences in toy preferences reflect postnatal social experience as well as innate factors (see, e.g., Hines, 2004; Ruble et al., 2006). Influences of socialization are suggested by studies showing that parents, peers and teachers encourage girls and boys to play with sex-typical toys, and discourage boys in particular from playing with cross-gendered toys (Fagot and Patterson, 1969; Fagot, 1978; Fagot and Hagan, 1991; Langlois and Downs, 1980; Lytton and Romney, 1991; Pasterski et al., 2005). In addition, children respond to information that objects (e.g., xylophones or balloons of a particular color) are for girls or for boys, by

showing a preference for the ones labelled as for their own sex (Masters et al., 1979). They also are more likely to prefer objects after observing models of their own sex choose them, and these effects are again particularly marked in boys (Masters et al., 1979; Perry and Bussey, 1979). Thus, sex differences in children's toy preferences appear to be multiply determined; innate influences are augmented by social encouragement, particularly in boys.

A comparison of the methods used to study children's and non-human primates' toy preferences may aid understanding of girls' and boys' object preferences, as well as the differences in results obtained by Alexander and Hines and Hassett et al. Both studies of monkeys observed animals in groups, whereas children are typically studied one at a time. Children also usually are observed in a playroom that contains many toys, some preferred by boys (e.g., vehicles, weapons), and some preferred by girls (e.g., dolls, tea sets). Often there also are neutral toys (e.g., books, puzzles), but little else, so that the child has little option but to play with the toys. Data are scored for duration or percentage of time spent by each sex with each of the toy types. (Using percentages adjusts for individual differences in overall time spent with toys). Then, four questions can be asked. 1. Do boys spend more time with boys' toys than girls do? 2. Do girls spend more time with girls' toys than boys do? 3. Do boys spend more time with boys' toys than with girls' toys? 4. Do girls spend more time with girls' toys than with boys' toys? (Fig. 1) All of these measures reflect preference, although the last two also depend on how well the incentive values of the masculine and feminine toys are matched.

In some studies, only some of the four expected effects are seen. For instance, Berenbaum and Hines (1992) found only three of the four differences to be significant. Specifically, although girls spent somewhat more time with girls' toys than with boys' toys, this difference was not statistically significant. Because of some similarity to this pattern of findings reported by Berenbaum and Hines (1992), Hassett et al. contend that their results are more similar to those seen in children than are Alexander and Hines's. However, Hassett et al. saw two of four possible sex differences when analyzing frequency of toy contact and only one of four when analyzing duration of contact, the measure most similar to that typically used in studies of children. In contrast, Alexander and Hines saw three of the four possible differences. Therefore, Hassett et al.'s contention that their findings are more similar than are ours to those seen in children is questionable.

Why do some studies not find all four possible differences in children's interest in sex-typed toys? Sample size is obviously important, since larger samples are more likely to produce significant effects, but the specific toys used are important as well. The ability to detect preferences within each sex (i.e., girls' and boys' preference for same-sex over other-sex toys) depends on how interesting the toys are (i.e., they must have sufficient incentive value to motivate behavior). Pasterski et al. (2005) altered the toy set used by Berenbaum and Hines (over 15 years ago now), so that all the toys classified as sex-typed were in fact differentially preferred by girls versus boys. Using the new set of toys, all four expected results were seen, including

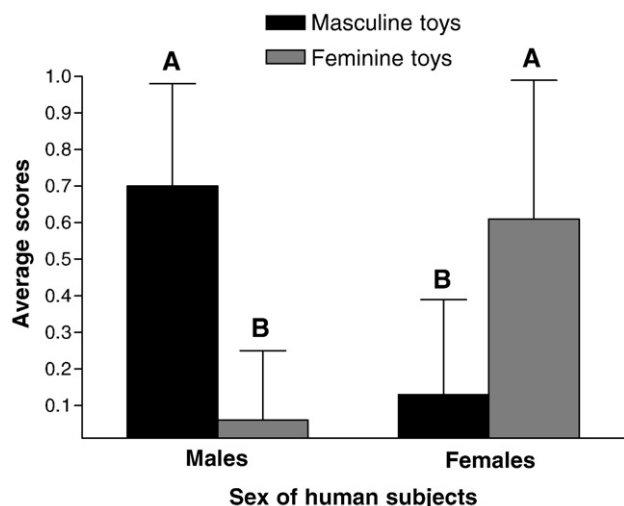


Fig. 1. Sex differences in children's toy preferences. Data (from Pasterski et al., 2005) are means and standard deviations for percent play time with masculine and feminine toys by boys and girls. All four possible differences are significant. (Different superscripts within toy category or within sex indicate significant differences). 1. Boys spend more time with boys' toys than girls do. 2. Girls spend more time with girls' toys than boys do. 3. Boys spend more time with boys' toys than with girls' toys. 4. Girls spend more time with girls' toys than with boys' toys.

greater interest on the part of girls in girls' toys over boys' toys (Fig. 1). Similarly, studying human toy preferences in early infancy, when socialization influences are less extensive than in later childhood, one of us also has found the same three sex differences as in our study of vervet monkeys, including the female preference for a doll over a truck, but no male preference for a truck over a doll (Alexander et al., submitted for publication, available on request).

Hassett et al. attribute the difference between their findings and ours to their introduction of toys two at a time (one wheeled toy and one plush toy), instead of one at a time. We disagree and think that a more important difference is their use of plush toys, which show only a weak, if any, sex difference in preference, as feminine toys. In fact, in our 2002 study of vervets, we used a plush toy (a stuffed dog) as a sex-neutral toy, and, as expected, there was no sex difference in interest in it. Alexander and Hines also had a larger sample (63 animals versus 34 in Hassett et al.), and Hassett et al. did not include neutral toys.

We also disagree with Hassett et al.'s assertion that our 2002 report did not measure toy preference. In both studies of monkeys, the animal enclosures included stimuli that are typically not present in studies of children, notably other animals who can be engaged socially, and, in our study at least, other objects, such as branches and ropes for climbing. Thus, both when toys are introduced one at a time and when they are introduced two at a time, the animals are showing a preference for a child's toy over other objects and activities in their environment. A similar approach to Alexander and Hines's would be to add food to the normal environment, with mango added to the buffet table on some days and pineapple added on other days. If more mango is eaten than pineapple, this shows a greater preference for mango.

Now two studies of monkeys support the idea that non-human primates show some, but not all, of the sex-related differences in toy preferences seen in children. Investigating why all four differences are not seen in monkeys could help identify the specific aspects of sex-typed toy preferences that derive from our genetic heritage and are shared with other primates, and those that are more sensitive to socialization. Our 2002 results suggested that male disinterest in toys that girls usually prefer might be particularly sensitive to socialization, and this possibility fits well with evidence from studies of children

(cited above) showing stronger socialization pressures on the toy choices of boys than girls. Hassett et al.'s results may suggest that other aspects of the sex differences seen in children might not exist in non-human primates. Further research, using different toys demonstrated to show sex differences in children, presented in different ways, could help determine which pattern of results is more characteristic of non-human primates and which of the sex differences seen in children are also shown by them.

We concluded in our original report that non-human primates provide a valuable approach to examining what it is about a truck that appeals to a male brain, and what it is about a doll that appeals to a female brain (Alexander and Hines, 2002). There are now two non-human primate species where various models can be tested, and compared with human findings. In addition, it might be possible to examine whether socialization effects similar to those seen for children apply to other species. For instance, if some animals of one sex could be trained to use a particular object, would others of that sex model them? And, if so, does this occur more readily in one sex or the other? And, of course, do hormone treatments early in life alter patterns of toy preferences as they do other behaviors that show sex differences? We hope this second study, along with our initial 2002 report, will encourage pursuit of these possibilities.

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